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(54) COMMERCIAL SCENE DETECTOR AND ITS DETECTION METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To allow a detector to detect accurately whether a television signal received at present is a commercial program or a proper broadcast program.
SOLUTION: A silence detection circuit 8 detects a silence period of an audio signal SA. A scene change detection circuit 9 detects a scene change point of an image from a video signal SV for the silence period detected by the silence detection circuit 8. A commercial period detection circuit 10 detects whether or not a time interval of scene change points detected by the scene change detection circuit 9 follows a prescribed rule. A tuner 3 detects a multiplex sound mode SSA of a received audio signal.

CLAIMS

[Claim(s)]
[Claim 1]A commercial sensing device which detects whether the receiving contents of the television broadcasting signal which consists of an image and an audio signal characterized by comprising the following are commercials.
A non-voice interval detection means to detect a non-voice interval of the above-mentioned audio signal.
A scene change detection means to detect a scene change point of a picture from a video signal in a non-voice interval detected by the above-mentioned silent vocal register detection means.
A scene change interval detecting means which detects whether a rule that a time interval of a scene change point detected by the above-mentioned scene change detection means

is constant is followed.
A voice multiplex-mode detection means to detect the voice multiplex mode of the above-mentioned received voice signal.

[Claim 2]The commercial sensing device according to claim 1 detecting whether the above-mentioned scene change interval detecting means is an abbreviated integral multiple whose time interval of the above-mentioned scene change point is 15 seconds.
[Claim 3]Detect a non-voice interval of a received voice signaland a scene change point of a picture is detected from a received video signal in this non-voice intervalA commercial detecting method detecting that the receiving contents of the television broadcasting signal are commercials if a rule that a time interval of this scene change point is constant is followed and it detects that the voice multiplex mode of the above-mentioned received voice signal is a stereo further.
[Claim 4]The commercial detecting method according to claim 3 being an abbreviated integral multiple whose time interval of the above-mentioned scene change point is 15 seconds.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention is appliedfor example to image recording playback equipment like a home videotape recorderand relates to an effective commercial sensing device and detecting method.
[0002]
[Description of the Prior Art]Receive television broadcasting and it records with an image recorder like a videotape recorderWhen it is reproducedthe commercials inserted in the middle of edited by a program book are flownthe demand of liking to see only this editing is advanced by the televiewerand record which reduced the commercial sectionsor reproduction came to be performed.
[0003]Howeverthe commercial detecting method adopted as the conventional home videotape recorder was simple strictlyand it was difficult to distinguish the volume commercials and on program book automaticallyand in order to carry out record which carried out exact commercial deletionit could not but depend on the user's handicraft.
[0004]The simple commercial detecting method known conventionally is explained below with reference to drawings. Drawing 8 is a block diagram showing an example of the commercial detector circuit 20 which adopts the conventional commercial detecting method and is carried in a videotape recorder etc.
[0005]In this drawing 8it restores to the RF signal inputted from the antenna 21 which is an RF input terminal with the tuner 22and an audio broadcast signal is separated from the television broadcasting signal to which it restored. This audio broadcast signal is supplied to the non-voice interval checking circuit 23 and the voice multiplex-mode signal detection circuit 24.
[0006]The non-voice interval checking circuit 23 restores to the inputted above-mentioned audio broadcast signal to a voice baseband signaldetects a non-voice part from

the amplitude leveland detects whether the rule that the time interval of the detection is constant is followed.
[0007]Since the commercial section is generally an abbreviated integral multiple for 15 secondswhen the time interval at which a non-voice part appears is an integral multiple for 15 secondsit can be judged that input signals are commercials. Since a non-voice part is generated here also except a start and end point of commercialsIn order to avoid that it serves as an integral multiple for 15 seconds accidentally by chanceand judges it as commercialsThe non-voice detection produced on the conditions of the above-mentioned interval checki.e.the integral multiple for 15 secondsjudges it as commercialsmultiple timesfor examplewhen it repeats twiceand it is made to output as a non-voice interval check outputi.e.a commercial detect output.
[0008]On the other handin the voice multiplex-mode signal detection circuit 24the present mode of the inputted above-mentioned audio broadcast signali.e.a monophonic recordinga stereoand each mode of two languages are encoded and outputted to 2-bit digital data. For exampleat the time of a monophonic recordingin "00" and a stereoit encodes with "01"and encodes with "10" by two languages.
[0009]This editing mode detector circuit 25 is provided with the delay circuit 26D flip-flop 27and the pulse generating circuit 28gives this delay of some for about several seconds in inputting the output of the voice multiplex-mode signal detection circuit 24 into the delay circuit 26and leads it to the input edge of D flip-flop 27.
[0010]On the other handthis editing mode detector circuit 25 of this inputs the interval check output of the non-voice interval checking circuit 23 into the pulse generating circuit 28When time observation of this check output is carried out about 2 minutes and 1 time does not have a non-voice interval check outputi.e.a commercial detect outputeitherthe present input signals are not commercialsit judges that it is this editing and a pulse is made to be built. By making it lead this pulse to the clock end of the above-mentioned D flip-flopthe encoding value of the voice multiplex mode of this editing is always held at the output of the above-mentioned D flip-flop.
[0011]Being delayed to the detect output of the voice multiplex mode in the delay circuit 26It is for avoiding that a voice multiplex-mode detect output becomes unstablewhen it is expected that change takes place to the voice multiplex mode simultaneously at the time of the commercial detect output used as the time of non-voice detection and a commercial detect output is inputted into the clock end of a D flip-flop.
[0012]One commercials' being less than 1 minute generally and the treatment for shortening response time make time to observe the commercial detect output of the non-voice interval checking circuit 23 about 2 minutes. And the output of above-mentioned D flip-flop 27 turns into an output of this editing mode output circuit 25.
[0013]In the mode comparison circuit 29the above-mentioned output of this editing mode detector circuit 25 and the output of the voice multiplex-mode signal detection circuit 24 are measuredif in agreementthe present input signal will be judged to be this editingif inharmoniousit will be judged as commercials and the result will be outputted.
[0014]When the voice multiplex mode shifts to other modes from the mode of this editingand does not shift to the mode of this editing after that again but generally shifts to the 3rd modeSince a program changes and it is expected that it is a pointthe mode comparison circuit 29 outputs the decision result of this editing / commercial indeterminate in this case.

[0015]
[Problem(s) to be Solved by the Invention]By the waysince the above-mentioned commercial detector circuit 20 is performing commercial detection only by the speech information of the interval of the voice multiplex mode and a non-audio parterroneous detection will occur frequently considerably.
[0016]In the case of a stereo or bilingual broadcastthe method of preventing erroneous detection had none of especially these editing broadcasts. Although the necessity of carrying out commercial detection from the former like **** based on speech information was knownthe decisive means which is only a simple method also from a detection ratioand improves detection capacity did not exist.
[0017]Thenthis invention is made in view of the above-mentioned actual conditionand aims at offer of the commercial sensing device and detecting method which can distinguish correctly whether the television broadcasting signal received now is a volume commercials or on program book.
[0018]
[Means for Solving the Problem]In order that a commercial sensing device concerning this invention may solve an aforementioned problemA non-voice interval detection means detects a non-voice interval of a received voice signaland a scene change detection means detects a scene change point of a picture from a received video signal in a non-voice intervalIt detects following a rule that a time interval of a scene change point is constantby a scene change interval detecting meansand a voice multiplex-mode detection means detects further that the voice multiplex mode of the above-mentioned received voice signal is a stereo.
[0019]A commercial detecting method concerning this inventionIn order to solve an aforementioned problemdetect a non-voice interval of a received voice signaland a scene change point of a picture is detected from a received video signal in this non-voice intervalA rule that a time interval of this scene change point is constant is followedand it detects that the voice multiplex mode of the above-mentioned received voice signal is a stereo further.
[0020]In the starting point and an end point of each commercials which can generally specifically be set without between this editingbetween commercials and commercialsand commercialsa non-voice interval for about 0.1 to 2 seconds appears in remarkable high probabilityAnd that a scene change point of a picture is between the non-voice intervaland a thing [one business time of each commercials / an abbreviated integral multiple for 15 seconds]And the commercial broadcast section uses that the voice multiplex mode is a stereo modeand when the section when a scene change point at the time of a non-sound appeared in an abbreviated integral multiple for 15 seconds atand was moreover started by an integral multiple for the 15 seconds is a stereophonic broadcastit judges the section to be the commercial section.
[0021]
[Embodiment of the Invention]It explains referring to drawings for the embodiment of the commercial sensing device concerning this inventionand a detecting method hereafter.
[0022]This embodiment is the commercial detector circuit 4 of drawing 1 which detects whether the receiving contents of the television broadcasting signal which consists of an image and an audio signal are commercialsand it has it in the television broadcasting recorder 1.

[0023]In this television broadcasting recorder 1it gets over with the tuner 3and the RF signal inputted from the antenna 2 which is an RF input terminal is inputted into the commercial detector circuit 4respectivelyafter separating into audio signal $S_A$voice multiple-signal $S_{SA}$and video-signal S_V. Especially the tuner 3 detects the voice multiplex mode from a voice multiplex pilot signal etc.and inputs the above-mentioned voice multiple-signal S_{SA} into the commercial detector circuit 4.
[0024]Although this voice multiplex mode has a monophonic recordinga stereoand three kinds of two languagesit is sent in code which TEREO calls "1" and is called "0" in this embodiment except a stereo.
[0025]The commercial detector circuit 4 is provided with the following.
The non-voice part detector circuit 8 which detects the non-voice interval of the above-mentioned audio signal S_A.
The scene change detector circuit 9 which detects the scene change point of a picture from video-signal S_V in the non-voice interval detected by this non-voice part detector circuit 8.
The commercial section detection circuit 10 used as the scene change interval detecting means which detects whether the rule that the time interval of the scene change point detected by this scene change detector circuit 9 is constant is followed.
The above-mentioned tuner 3 used as a voice multiplex-mode detection means to detect voice multiplex-mode S_{SA} of the above-mentioned received voice signal.

[0026]In the commercial detector circuit 4commercial detection is performed using audio signal S_A inputted from the tuner 3video-signal $S_V$and voice multiplex-mode signal $S_{SA}$and a commercial decision signal is outputted.
[0027]The flow of the signal in this commercial detector circuit 4 and processing are explained below. As for audio signal S_A inputted from the tuner 3dispersion by a predetermined sampling frequency and quantization with a predetermined quantization leveli.e.A/D conversion processingare performed by the A/D conversion circuit 5. In this embodimentquantization of 16 kHz of sampling frequencies and 16 bits of bit length is performed.
[0028]The voice data digitized with A/D converter 5 is inputted into the non-voice part detector circuit 8 in the general purpose processor 7. In this embodimentthis general purpose processor 7 was constituted from a computerand has all realized the non-voice part detector circuit 8the scene change detector circuit 9and the commercial section detection circuit 10 by software.
[0029]In the non-voice part detector circuit 8it asked for the average sound level of the ** frame by calculationand the non-voice interval is detected by whether the average level is smaller than a predetermined threshold. The situation of calculation of the above-mentioned average sound level is shown in drawing 2and the flow of non-voice interval detection processing is shown in drawing 3.
[0030]Firstthe non-voice part detector circuit 8 incorporates the digital sound data outputted from the A/D conversion circuit 5 at Step S1 of drawing 3. Heresince it is processing at the rate of 30 frames in 1 secondas shown in (A) of drawing 216 kHz (sample)/30 frames digital sound data is incorporated. And at Step S2absolute value-ization of the above-mentioned sample is performedas shown in (B) of drawing 2and at Step S3as shown in (C) of drawing 2an average level is computed.

[0031]Nextit is judged whether the above-mentioned average level is smaller than a predetermined silent threshold at step S4When smaller than a small namelysilent threshold predetermined [above-mentioned] in the above-mentioned average level herewhen it is more than a silent threshold conversely predetermined [above-mentioned] again about a silent decision outputan owner sound decision output is taken out with Step S5 at Step S6. It means that taking out a silent decision output had judged with the frame being a silent interval.
[0032]On the other handvideo-signal S_V outputted from the tuner 3 is inputted into the commercial detector circuit 4and is inputted into the delay circuit 6the delay circuit 11and the scene change detector circuit 9.
[0033]The delay circuit 6 comprises a frame memory of the predetermined frame number of one frame. From this delay circuit 6the video signal with which only the time corresponding to a predetermined frame number was delayed is inputted into the scene change detector circuit 9.
[0034]In the scene change detector circuit 9the output from the non-voice part detector circuit 8the delayed video signaland the through video signal by which direct supply was carried out without delay from the tuner 3 are considered as an inputand scene change detection in a non-voice interval is performed. It explains referring to drawing 4 for flowing into processing in this scene change detector circuit 9.
[0035]Firstthe output from the non-voice part detector circuit 8 is received at Step S11By judging whether the above-mentioned output is a silent judging at Step S12and progressing to Step S15if it is an owner sound judgingsince the frame is not the starting point of commercialsand a terminal pointthe output that they are not the starting point and the terminal point candidate point of commercials is taken out. When it judges with it being a silent judging at Step S12it progresses to the judgment routine of the scene change of Step S13 and Step S14.
[0036]The inter-frame-correlation judging performed at Step S13 compares the delay video signal and through video signal which were inputtedand computes the correlation. The method of using correlation of the histogram of (1for examplethe signal level of each picture) for a mutually related calculation method(2) the method of taking difference about each pixel of each screenand making the integral value a correlation valueand (3) -- each screen is divided into two or more fieldsand how to calculate correlation in each field and to take majority etc. can be considered. Herethe method of of (2) considered to be the simplest is adopted. It explains referring to drawing 5 for this method of (2).
[0037]Image size is also made with nxm the delayed picture image data and through picture image dataand horizontal coordinates are set to i and it makes [perpendicular direction coordinates] S_{ij} the data of the coordinates (ij) of $D_{ij\ and}$ through image drawing for the data of the coordinates (ij) of j and delay image drawing.
[0038]The correlation value E of the picture of two sheets is E=sigmasigmaabc (D_{ij}-S_{ij}) when abc is made into the function which calculates an absolute value.
It can come out and express.
[0039]When the correlation value E between the pictures computed at the above-mentioned step S13 by Step S14 judges with it being larger than a predetermined thresholdIt will be smallprogresses to the following stepand it outputs [there was a scene change the degree of correlation of the picture of two sheetsthat is] it as a candidate point of the starting point and the terminal point of commercials. When the output value of

Step S13 is smaller than a predetermined thresholdit progresses to Step S15and if this frame is not a candidate point of the starting point and the terminal point of commercialsit will be outputted.
[0040]Voice multiplex-mode signal S_{SA} from the output and the tuner 3 of the scene change detector circuit 9 is inputted into the commercial section detection circuit 10. The commercial section detection circuit 10 has a memory area which memorizes the voice multiplex-mode signal from the output and the tuner 3 from the scene change detector circuit 9 by predetermined time. Generallythe commercials in television broadcasting are less than 1 minute the longest in many casesand are preparing the memory for 1 minutei.e.RAM with the capacity of 120(second)x30(frame)x2(data)x1 (bit).
[0041]And within this RAMif the output from the scene change detector circuit 9 is a candidate point of the starting point and the terminal point of commercialsas it is shown in drawing 6if it is not a candidate point about "1"0will be memorized to Scene_Change [Frame].
[0042]Similarlyif the voice multiplex-mode signal from the tuner 3 is a stereothe monophonic recording except a stereo that isand when bilingual0will be written for "1" in Audio_Multi [Frame]. Scene_Change [Frame] in RAM has a field from the present frame to the frame of one quota.
[0043]The example of detection of the actual commercial section in this commercial section detection circuit 10 is shown in drawing 7. A commercial detection result is shown in (C) of the section summarized to (A) of drawing 7 for every scene changethe section summarized to (B) of drawing 7 for every voice multiplex modeand drawing 7.
[0044]The voice multiplex mode is a stereoand since the section is moreover continuing by the integral multiple for 15 secondsthe sections 1-4 are detected as the commercial section. Although the section 7 is moreover following the sections 8-9 in 15 secondssince the voice multiplex mode is a monophonic recordingcommercials are not distinguished.
[0045]The commercial section detection circuit 10 outputs "1"when the frame of one quota is judged to be the commercial sectionand when it was not the commercial section and distinguishesit outputs "0."
[0046]On the other handaudio signal S_A outputted from the tuner 3 and video-signal S_B are inputted also into the delay circuit 11respectively. After modulating a sound and an imagesince it is necessary to synchronize with the commercial detecting signal outputted from the commercial section detection circuit 10 when recording on a recording mediuma synchronization is taken in this delay circuit 11. Since it has a buffer (memory) for 1 minute in the commercial section detection section 10 for commercial detection in the case of this embodimentit is necessary to perform delay processing for 1 minute in the delay circuit 11. Although realizing by a memory is also possibleby this embodimentthe relation of capacity has realized this using hard disk drive **.
[0047]The output of this delay circuit 11 is inputted into the modulation circuit 12. Hereabnormal conditions called eight-to-fourteen modulation are applied to the signal aspect for writing a sound and a video signal in a recording medium. Processing of data compressionssuch as MPEG and JPEGetc. are included here.
[0048]If the output of the modulation circuit 12 is write-in permissionit will be supplied to the writing device 14 by the state of the write-in permission switch 13and will be recorded on the recording medium 15. The sound and video signal which the write-in permission switch 13 was closed when the commercial detecting signal from the

commercial section detection circuit 10 was "1"and were modulated are told to the writing device 14.
[0049]The writing device 14 has electricmagneticopticalphysicalor a function recorded on the recording medium 15 with the above combination for the sound and video signal after the abnormal conditions inputted through the write-in permission switch 13.
[0050]The recording medium 15 is a medium which can record and store the data of a compact diska magneto-optical disca hard disketc. which can be written in.
[0051]Thussince the television broadcasting recorder 1 used as this embodiment is provided with the commercial detector circuit 4 which performs exact commercial detectionit can record only this editing program which removed commercials on the recording medium 15.
[0052][Effect of the Invention]The commercial sensing device concerning this invention detects the non-voice interval of a received voice signal by a non-voice interval detection meansA scene change detection means detects the scene change point of a picture from the received video signal in a non-voice intervalSince it detects following the rule that the time interval of a scene change point is constantby the scene change interval detecting means and a voice multiplex-mode detection means detects further that the voice multiplex mode of the above-mentioned received voice signal is a stereoCommercials are automatically and correctly detectable from the receiving contents of the television broadcasting signal.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of the television broadcasting recorder provided with the commercial detector circuit used as the embodiment of the commercial sensing device concerning this inventionand a method.
[Drawing 2]It is a figure for explaining the calculation of the average sound level for every frame which the non-voice part detector circuit which constitutes the above-mentioned commercial detector circuit performs.
[Drawing 3]It is a flow chart which shows the flow of processing of the above-mentioned silent vocal-parts detector circuit.
[Drawing 4]It is a flow chart which shows the flow of processing of the scene change detector circuit which constitutes the above-mentioned commercial detector circuit.
[Drawing 5]It is a figure for explaining the inter-frame-correlation judging performed in the above-mentioned scene change detector circuit.
[Drawing 6]It is a figure for explaining data processing in RAM with which the commercial section detection circuit which constitutes the above-mentioned commercial detector circuit is provided.
[Drawing 7]It is a figure showing the example of detection of the commercial section which the above-mentioned commercial section detection circuit performs.
[Drawing 8]It is a block diagram of the videotape recorder which adopted the conventional commercial detecting method.
[Description of Notations]
1 A television broadcasting recorder and 3 [A non-voice part detector circuit and 9 / A SHINCHIENJI detector circuit and 10 / Commercial section detection circuit] A tuner

and 4 A commercial detector circuit and 7 A general purpose processor and 8